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HEAT DISSIPATION DEVICE FOR COMMUNICATION REPEATER

Designer:	Kiyoshi Sekikawa NEC Corp. 5-33-1 Shiba, Minato-ku, Tokyo
Applicant:	NEC Corp. 5-33-1 Shiba, Minato-ku, Tokyo
Agent:	Rikichi Somekawa, patent attorney

[There are no amendments to this design.]

Claim

Heat dissipation device for communication repeater characterized in that a metal element equipped with heat-dissipating fins is tightly fitted against the outer circumference of the repeater shell with an intervening resin.

Detailed explanation of the design

The present design pertains to a communication repeater. In particular, it pertains to a heat-dissipating device for a communication repeater of the type that is enclosed in a thin, sheet-metal casing shell that is normally housed in a manhole [sic], wherein the heat generated during repeater operation is effectively dissipated to the outside without sacrificing airtightness or corrosion-resistance when submerged in water.

This type of communication repeater is normally constituted with a variety of electronic components required for high reliability packaged at high density in the unit, and with the outside of said unit enclosed airtightly in a shell body composed of thin sheet metal. Such a repeater generates heat during operation, which causes the internal temperature to rise. This rise in internal temperature results in a reduction in the reliability of the internal electronic components and causes a degradation of the service life of the components. In general, there is no way to dissipate the heat generated by this type of repeater except to transmit it through the inner frame to the shell body and then naturally to the outside through the surface of the shell body, allowing the heat to escape into the space of the manhole, or installation environment. The efficiency of this process is the concern of the present design. On the other hand, a repeater housed in a manhole is installed underwater, so that the cover portion of the shell body must have a sealed structure, and the shell body itself must have satisfactory corrosion resistance when submerged so that it can maintain impermeability over a long period of time.

A conventional communication repeater with a thin, sheet-metal shell body will be explained with reference to the external oblique view of Figure 1 and the longitudinal cross section of Figure 2. Repeater (7) is supported on inner frame (6), and shell body (1) formed with thin sheet metal is attached to the outside of inner frame (6). Cover (3) is attached to shell body (1) with multiple screws (2) via gasket (5). In this case, gasket (5) is compressed to a prescribed thickness by tightening screws (2) against shell body (1), which seals the inside of the shell body. The side surfaces and bottom surface of shell body (1) have flat surfaces that are produced by working thin sheet metal. Here, shell body (1) and cover (3) must be corrosion-resistant for a long period of time, since the repeater is installed underwater. Thus welding is not used, since it entails the danger of losing corrosion resistance. Stub cable (4) for connecting the trunk line cable to repeater (7) is impermeably sealed to shell body (1).

In the above-mentioned conventional structure, the heat dissipation path for the heat generated by repeater (7) is from repeater (7) to inner frame (6), to shell body (1), and then, from the surface of the shell body into the space of the manhole, or installation environment, as indicated by the arrows in Figure 2. In this case, as is known, the heat dissipation efficiency depends on the surface area of shell body (1). That is, the rise in temperature produced by the

heat generated by the repeater is determined by the surface area of shell body (1), and shell body (1) limits heat dissipation efficiency.

The purpose of the present design is to provide a heat dissipation device for a communication repeater that can increase the heat dissipation efficiency while ensuring conventional corrosion-resistance and impermeability for underwater installation.

For this purpose, the heat dissipation device of the present design has a hardware element attached to said shell body that is furnished with a heat-receiving surface tightly fitted along the entire outer circumference of the shell body of the communication repeater and a heat-dissipating surface with multiple fins that are exposed to the outside; resin is placed in the gap between the perimeter of the outer surface of the aforementioned shell body and the aforementioned hardware element.

An application example of the present design will be explained below with reference to the figures.

Figure 3 is an overall oblique view of a communication repeater to which a heat-dissipating device based on the application example of the present design is attached, and Figure 4 is a longitudinal cross section thereof and corresponds to Figure 2. Repeater (7), inner frame (6), shell body (1), and cover (3) have the same constitution as discussed with reference to Figures 1 and 2; thus, their detailed explanation will be omitted. In the application example shown, metal element (10) is box-shaped with a bottom and an open top, and multiple heat-dissipating fins (8) are formed on the external side walls. The dimensions of inside walls of metal element (10) are such that they fit tightly against the outside walls (outer circumference) of shell body (1) of the repeater. Resin layer (9), indicated by the thick line in Figure 4, is placed between the outside walls of shell body (1) and metal element (10) and aforementioned shell body (1) is inserted into aforementioned metal element (10) from the top. In this case, as shown in Figure 3, one side wall of metal element (10) is cut out from the opening at the top for a certain width downward, and is constructed so that stub cable (4) that protrudes from shell body (1) will fit into the cut-out portion. Resin layer (9) is used to join shell body (1) and metal element (10) tightly, so that the heat-transfer efficiency from shell body (1) to metal element (10) can be increased. The heat-dissipation path for this designed structure is explained with reference to Figure 4. The heat generated during operation of repeater (7) is transmitted from inner frame (6) to shell body (1); the transmitted heat in shell body (1) is transmitted through resin layer (9) to the inside surface of metal element (10), that is, the heat-receiving surface, which is tight against said resin layer, and is dispersed into the manhole or installation environment, as shown by arrow (A) in Figure 4 by heat-dissipating fins (8). The use of heat-dissipating fins (8), compared to the use of the conventional shell body (1) only, increases the heat-dissipation surface, so that the rise in temperature in repeater (7) can be more effectively controlled. This

type of repeater is to be used underwater, so that its corrosion-resistance will affect its service life. Thus, the present design does not employ welding for the repeater shell body, which is made of thin sheet metal, so that there will be no loss of corrosion-resistance and effective sealing and heat-dissipation characteristics can be ensured over a long period of time.

Brief description of the figures

Figure 1 is an oblique view showing an external view of a conventional communication repeater. Figure 2 is a longitudinal cross section of the repeater shown in Figure 1. Figure 3 is an external oblique view of a communication repeater that has a heat dissipating device based on an application example of the present design. Figure 4 is a longitudinal cross section of the repeater of Figure 3.

(1) ... shell body, (3) ... cover, (6) ... inner frame, (7) ... repeater, (8) ... heat dissipating fin, (9) ... resin layer, (10) ... metal element.

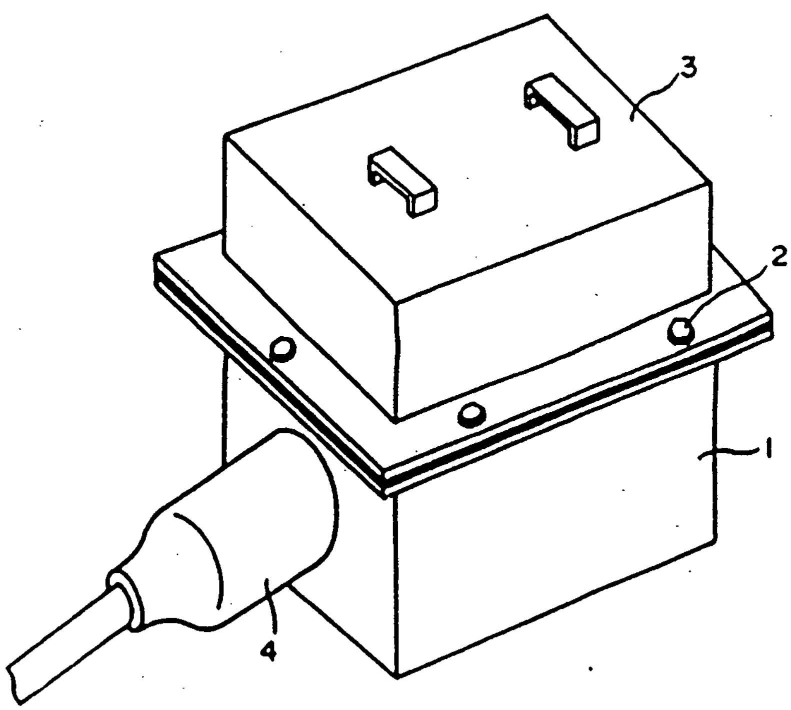

Figure 1

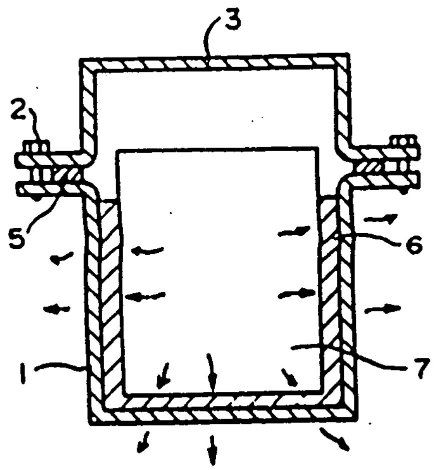

Figure 2

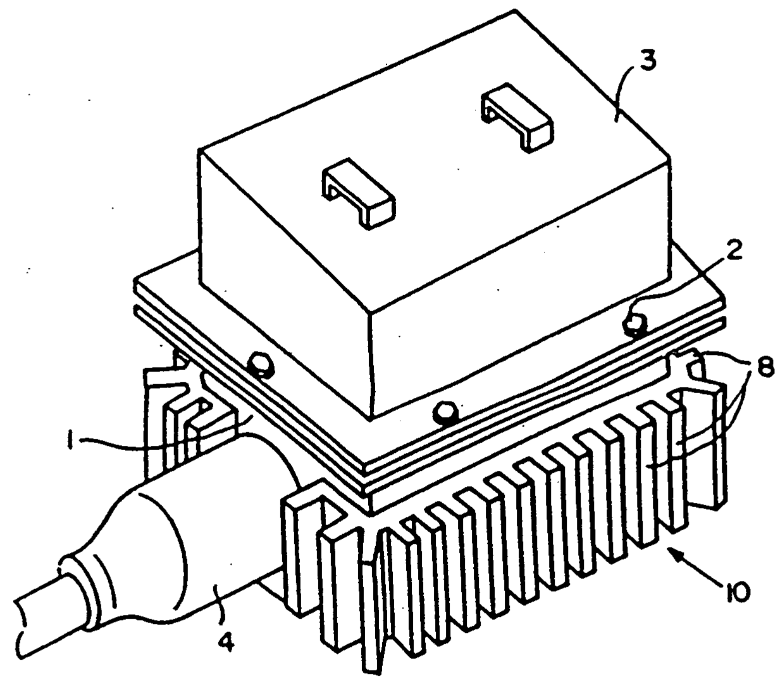

Figure 3

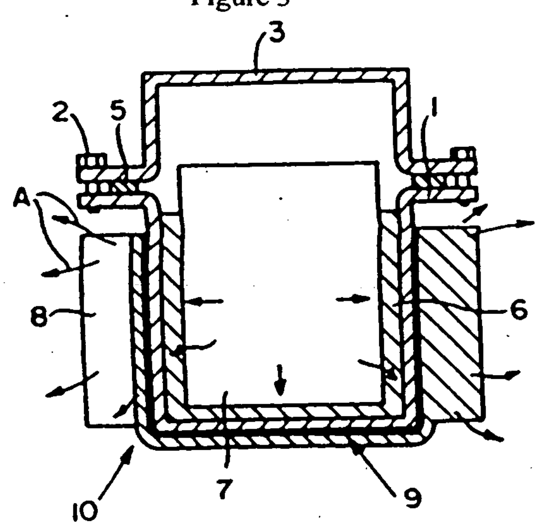

Figure 4